we can not help feeling that it is at most only a question of time when Mme. Curie's admission will be effected; assuming, as no doubt it may be assumed, that the opposition turns only on the question of sex. It is hardly to be supposed that this will be allowed, in our time, to prevent for very long the recognition of achievements of such unusual character, and of such extraordinary importance in the history of science, as those which she has accomplished. Incidentally, it may be remarked that to the logical mind there will be little to choose between her admission and her non-admission, as an argument against the views of those who still maintain that experience has shown women's incapacity for the highest forms of scientific production. If she is admitted, there will be one woman, out of the handful that devote their lives to scientific research, distinguished by one of the highest of scientific honors; if she is kept out, it will be one more proof of the immeasurable difference between the degree of encouragement and incentive held out to women and that held out to men for sustained devotion to strenuous intellectual labors.—*The N. Y. Evening Post.*

SCIENTIFIC BOOKS

An Introduction to the Theory of Optics. By Arthur Schuster, F.R.S., Honorary Professor of Physics at the University of Manchester. Second edition, revised. London, Edward Arnold. 1910.

The first English text-book on physical optics which had any considerable utility for college classes is probably that of Glazebrook, published in the early eighties. Of the many other texts and treatises on this subject which have appeared since there is probably none which shows better balance or more accurate scholarship than the one of which the second edition is now under review.

We pass at once to some of the noteworthy features of this treatment, and especially to the changes introduced into the second edition, merely pausing to commend the author's clarity and precision of style.

1. A nomenclature which has once been established and which carries with it a perfectly definite meaning is difficult to replace. But every one must admit the cogency of Professor Schuster's reasons for suggesting that we replace the term "simple harmonic motion" by "simple" or "normal" oscillation, since "*harmony* means a relation between different things and not a property of any particular thing."

The term "quasi-homogeneous," which does not appear in the former edition, is here introduced to denote actual monochromatic radiations met with in the laboratory as contrasted with the hypothetical (homogeneous) radiations described by the following equation, in which x is unlimited as to value:

$$y = a \cos 2\pi(t/T + x/\lambda).$$

As an illustration of the helpfulness of this concept one may refer to the last paragraph of art. 26, which is much clearer than the corresponding paragraph in the older edition; or one may cite the following sentence from the chapter on gratings:

> It is owing to the rapid falling off of light from both sides of the principal maxima, that the grating can be made use of to separate the different components of white light, and to produce quasi-homogeneous vibrations.

Another helpful term suggested (p. 60) in the new, but not in the old, edition is the word "coherent" to denote "vibrations which are related in phase owing to their having originated at the same ultimate source."

The following quantitative definition of spectral purity appears in a new form; but it is hardly self-contained or definite without additional explanation. Spectral purity is defined "as $\lambda/\delta\lambda$ where $\delta\lambda$ is the difference between two wave-lengths which just do not encroach upon one another."

2. In Chapter III. will be found a most instructive page of new material giving a comparison of the two methods of resolving white light, namely, into pulses and into homogeneous waves. The essence of the matter is contained in the following paragraph:

> The consideration of white light as a succession of impulses is very instructive and often simplifies calculations considerably, as we need only deal with a single impulse; while if we start from the

homogeneous vibration we have to perform the summation for all wave-lengths before we can arrive at a final result. It must be noted that we are at present not concerned with the question how the light originates; we take the disturbance as it is and try to represent it analytically, and just as there are many ways of resolving a system of forces so there are many ways of resolving the motion of light into elements with which we can deal analytically. The resolution by homogeneous waves is one, the resolution by impulses another. Whenever the two methods seem to yield different results a mistake has been made in their application.

The usefulness of this view-point is well shown in art. 64, where the author explains how a grating may impress its own periodicity upon a luminous impulse just as a picket-fence may turn an atmospheric impulse into a musical note.

3. The curiosity of every reader can hardly fail to be stimulated by the last sentence in the author's new preface, which runs as follows:

> My thanks are due to various friends and correspondents who have kindly pointed out a number of errors, which were left standing in the previous edition—but I feel a consoling though unmerited sense of satisfaction at the one serious blunder having remained unnoticed, and, I hope, undetected.

One change which the author introduces into his treatment of interference is so radical as to make one ask whether the remark just quoted from the new preface does not refer to the following sentence from p. 54 of the previous edition:

> There may, therefore, be interference of intensity, though there is no interference of displacement.

The new and precise definition of interference which replaces this idea in the later edition is as follows:

> *If the observed illumination of a surface by two or more pencils of light is not equal to the sum of the illuminations of the separate pencils, we say that the pencils have interfered with each other and class the phenomenon as one of interference* (p. 57).

The advantage derived from the adoption of this definition is obvious on reading art. 35.

4. A new section on the interferometer of Fabry and Perot is an addition of distinct value.

As to the mathematical treatment, it may in general be described as clear and elegant. There are, however, some distinct exceptions to this statement, of which the following instance will serve as a type. The neat elementary discussion of diffraction on p. 95 would be distinctly improved by deriving, instead of assuming, the value of the intensity factor $2/\pi$.

Among the striking omissions in the two chapters on diffraction is any mention of Cornu's spiral.

If the student is to be considered, the value of the book might be greatly enhanced by throwing into heavier type many of the more important results. To illustrate, the fundamental theorem, that "the brightness of the image [of a luminous surface] is equal to IS_ω/s," is buried in the context of p. 152 without comment. Much time and energy are saved the student when matters of first importance are emphasized in some way.

The index is very meager and cross-references contain numerous errors. It is to be hoped both of these may be corrected before the next printing and without waiting for a third edition.

The shifting of the article on Talbot's bands from the chapter on the Nature of Light to that on Diffraction is interesting in view of the two explanations of these bands recently given by the author and by Professor R. W. Wood.[1]

Even though this review is intended to deal mainly with the differences between the first and second editions, there are many other features in this admirable treatment which one can scarce resist commending. As an example may be mentioned the chapter on Rotary Effects, in which an excellent notation, description of phenomena and quantitative discussion are condensed into a few brief, but lucid, pages.

HENRY CREW

[1] *Phil. Mag.*, 7 and 18.